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Department of Energy

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APR 29 1997

DOE-0869-97

Mr. Gene Willeke
Fernald Citizens Task Force
P.O. Box 544
Ross, Ohio 45061

Dear Mr. Willeke:

SILO 3 INFORMATION NEEDS

References: 1) Memorandum, G. Willeke to J. Craig, "Silo 3 Information Needs," dated October 17, 1996.

2) Letter, J. Craig to G. Willeke, "Silo 3 Information Needs," dated November 15, 1996.

Enclosed are responses to the comments submitted by the Fernald Citizens Task Force (CTF) identifying Silo 3 information needs. The enclosed responses have been discussed with members of the CTF over the past several months. This formal transmittal of comment responses fulfills the Department of Energy, Fernald Environmental Management Project (DOE-FEMP) commitment to provide the requested information to the CTF.

If you have any questions, please contact Nina Akgunduz at (513) 648-3110, or me at (513) 648-3101.

Sincerely,

Jack R. Craig
Director

FEMP:Akgunduz

Enclosure: As Stated

5-7-1

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cc w/enc:

J. Applegate, FCTF
T. Patton, FDF/65-2
AR Coordinator, FDF/78

cc w/o enc:

G. Griffiths, DOE-FEMP
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RESPONSE TO FERNALD CITIZENS TASK FORCE COMMENTS ON THE DRAFT SILO 3 ALTERNATIVES EVALUATION REPORT
October 17, 1996

GENERAL COMMENTS

Commenting Organization: Fernald Citizens Task Force Commentor: FCTF
Section #: General Comment Page #: Line #:
Original Comment #: 1

Comment: Identify the administrative and legal requirements associated with changing the Silo 3 treatment from vitrification to stabilization, and again for Silos 1 and 2. Will this require an ESD or a ROD amendment? This information needs to come from EPA, and we would like to see as much clarity of this issue before the March 1 deadline as possible.

Response: Based upon published U.S. Environmental Protection Agency (USEPA) guidance (OSWER Directive 9355.3-02, "Guidance on Preparing Superfund Decision Documents", July 1989), if new information is generated after a Record of Decision (ROD) becomes effective that could impact the selected remedy, the information should be analyzed to determine if changes should be made to the selected remedy. There are three types of changes:

1) non-significant changes
2) significant changes
3) fundamental changes

Non-significant changes are minor changes that typically occur during the Remedial Design/Remedial Action engineering process and should simply be recorded in the post-ROD document file.

Significant changes are generally incremental changes that do not fundamentally alter the overall remedial approach. These changes can include a change in scheduling, costs, or implementability. Significant changes are documented in an explanation of significant differences (ESD). The following example of a significant difference is provided under Exhibit 8-2 of OSWER Directive 9355.3-02:

> "The lead agency decides to use carbon adsorption rather than air stripping to conduct the ground-water restoration activities. Because further investigation revealed that the volatile organics in the waste stream at the site are of low solubility and polarity, carbon adsorption will provide better removal efficiency on this waste stream than would air stripping. The basic pump and treat remedy remains unaltered, and the performance level specified in the ROD will still be met by the new technology. The lead agency prepares an ESD to notify the public that the new technology is to be used. No amendment to the ROD is necessary and remedial design can continue."

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Fundamental changes include changes that alter the ROD such that the proposed action, with respect to scope, performance, or cost, is no longer reflective of the selected remedy in the ROD. Fundamental changes are documented in an amendment to the ROD. The following example of a significant difference that fundamentally alters a selected remedy is provided under Exhibit 8-4 of OSWER Directive 9355.03-02:

> "The lead agency determines that incineration capacity cannot be secured in the time period necessary for remediating the site. The lead agency proposes to use bioremediation rather than the thermal destruction originally selected to address the contaminated soil. This new remedy is fundamentally different from the remedy selected in the ROD, and an amended ROD must be prepared. Remedial design for the source control remedy is halted because the thermal destruction remedy is no longer implementable. Data collection to support the design of the bioremediation option and RD/RA on the ground-water remedy may proceed."

It is the position of the Department of Energy-Fernald Environmental Management Project (DOE-FEMP) that modifying the selected remedy from vitrification to stabilization/solidification for the Silo 3 wastes would not fundamentally alter the original remedial objectives of the approved Operable Unit 4 (OU4) ROD. Stabilization/solidification (stabilization) would still reduce the dispersibility and mobility of the wastes and the constituents of concern. It is DOE-FEMP's position that an ESD would be sufficient to modify the selected remedy for the Silo 3 wastes from vitrification to stabilization. This is still under discussion with the regulators.

Modifying the selected remedy from vitrification to stabilization of Silos 1 and 2 would fundamentally alter the overall remedy approved in the OU4 ROD. Therefore, a ROD-Amendment would be required if the selected remedy for Silos 1 and 2 were to be modified from vitrification to stabilization.

The ROD-Amendment and the ESD documents are similar in that they each provide a description of the proposed changes and a comparison to the nine criteria identified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The ROD-Amendment also requires a revised Proposed Plan. An ESD is estimated to take at least six months to prepare and obtain approval by the DOE-FEMP in concurrence with the USEPA and the Ohio EPA (OEPA). In comparison, a ROD-Amendment is estimated to take at least eighteen to twenty-four months to prepare and get approved due to the additional need of the revised Proposed Plan, which also must be

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reviewed and approved by the DOE and USEPA in concurrence with the OEPA. Both the ROD-Amendment and the ESD process will include a public comment period, as well as public meetings to involve stakeholders in the decision making process.

Action: The decision on the appropriate regulatory mechanism for modifying the approved ROD for the Silo 3 wastes is anticipated in May 1997. DOE-FEMP will initiate modification of the ROD pending agreement by USEPA, OEPA, and stakeholders on a final path forward for remediation of the Silos wastes.

Commenting Organization: Fernald Citizens Task Force   Commentor: FCTF
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Original Comment #: 2

Comment: a) Provide as much information as possible on the potential effectiveness of cementation on the Silo 3 material. It is our understanding that similar materials on site have been solidified and this information needs to be made available.

b) In addition, we believe there is sufficient time between now and March 1 to conduct testing on actual Silo 3 materials and would like to see such an effort begin as soon as possible. There is an additional concern that we do not have an accurate understanding of the compounds contained in Silo 3 (analysis has been limited to an elemental analysis), and this casts some doubt on the legitimacy of the surrogates currently being used. A compound analysis should be performed to ensure that all future testing results in accurate information.

Response: a) The FEMP has successfully completed the stabilization of 7,150 gallons of liquid thorium nitrate and 2,500 drums of uranium/thorium mixed waste to remove their associated hazardous characteristic. The treated waste form generated from the stabilization process meets the waste acceptance criteria (WAC) for the Nevada Test Site (NTS) which allows for disposal of the stabilized waste form at the NTS. These two waste streams are similar to the Silo 3 wastes in that they exhibit the toxicity characteristic for several Resource Conservation and Recovery Act (RCRA) metals. Attachment 1 presents a summary table of the results from the toxicity characteristic leaching procedure (TCLP) for both the untreated and stabilized/solidified thorium nitrate and the uranium/thorium mixed waste streams.

b) Fluor Daniel Fernald (FDF) is performing a bench-scale treatability study focusing on stabilization of actual Silo 3 wastes. The majority of the scope of the treatability study has been completed and initial data confirms that stabilization is effective in treating the Silo 3 wastes. The preliminary data also supports the waste loading that was assumed in the Silo 3 Alternatives

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Evaluation. A draft of the final report is scheduled to be completed in April, with a final report scheduled for completion in May 1997.

Compound analysis is being performed on actual Silo 3 wastes by Argonne National Laboratories to identify the chemical compound species present in the Silo 3 wastes and to confirm assumptions that were based on previous elemental analysis and the calcining process. Information from the compound analysis will be provided to qualified subcontractors interested in submitting proposals for remediation of the Silo 3 wastes. It should be noted that proof-of-process testing performed by the selected subcontractor will be conducted using actual Silo 3 wastes.

In addition, a small sample of the Silo 3 wastes (500 milligrams) was provided to Miami University of Oxford, Ohio, for single-crystal or powder x-ray analysis. Based on their analysis, Miami University was only able to identify one compound (calcium sulfate, $CaSO_4$) found in the sample. FDF received a copy of the final report from Miami University on March 5, 1997.

Action: FDF will make available to the public all information obtained from the treatability study and compound analysis performed on Silo 3 wastes.

Commenting Organization: Fernald Citizens Task Force Commentor: FCTF
Section #: General Comment Page #: Line #:
Original Comment #: 3

Comment: There is significant concern regarding the increased volume of wastes associated with cementation. We would like a detailed analysis on the volume of waste associated with vitrification versus cementation.

Response: Based on the technical baseline, if Silo 3 wastes were vitrified, they would be vitrified in a blended formulation with Silos 1 and 2 wastes. A comparison of the total disposal volume for vitrified Silos 1, 2, and 3 wastes versus that for vitrified Silos 1 and 2 wastes and cement stabilized Silo 3 wastes indicate there would be no significant increase in total <u>disposal</u> volume if the Silo 3 wastes were cement stabilized. Vitrified Silos 1 and 2 wastes require a container that offers the necessary radiation shielding to protect workers and the public during handling and transportation of the Silos 1 and 2 wastes. The current container design consists of 6-inch thick reinforced concrete walls to keep radiation levels as low as reasonably achievable (ALARA). The radiological characteristics of the resulting vitrified Silos 1, 2, and 3 combined material would still require the use of this same container.

In comparison, cement stabilized Silo 3 wastes could be placed in white metal boxes constructed of 12-gauge steel, typical of other waste shipments

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that leave the FEMP. Although vitrification results in a reduction in treated waste volume, this reduction is offset by the increase in disposal volume associated with the concrete container required to keep radiation levels ALARA. Figures 1 and 2, in Attachment 2, present a volume comparison for the vitrified Silos 1, 2, and 3 wastes versus vitrified Silos 1 and 2 wastes and cement stabilized Silo 3 wastes, respectively. These comparisons are based on data presented in Volume 2 of 2 of the Draft Final Evaluation of Silo 3 Wastes Alternatives Report (December 1996).

A similar evaluation comparing the total disposal volume for vitrified Silo 3 wastes (only) and cement stabilized Silo 3 wastes (only) has also been conducted. This information is presented in Volume 1 of 2 of the Draft Final Evaluation of Silo 3 Wastes Alternatives Report and is included as Figure 3 of Attachment 2 in this comment response document. While there is a three-fold increase in total disposal volume associated with cement stabilized Silo 3 wastes versus vitrified Silo 3 wastes (separate from Silos 1 and 2 wastes), the benefits of the volume reduction are outweighed by the technical challenges posed by vitrification of the Silo 3 wastes as discussed below.

The post-ROD treatability studies have demonstrated that the implementability of the vitrification technology has proven to be more difficult than originally anticipated. While the development and application of the vitrification technology to the Silo 3 wastes on a pilot-scale basis has demonstrated that vitrification is technically feasible; it has also demonstrated that continuous processing of the Silo 3 wastes by vitrification is hindered by the high concentrations of sulfates contained in the waste stream.

The Silo 3 waste contains relatively high concentrations of sulfates (approximately 15 wt%). The high sulfate concentration in the Silo 3 waste requires high melter operating temperatures (>1,150°C) to assure sulfate destruction, as well as, the addition of reductants to control sulfate layering and sulfate foaming events within the melt pool.

The FEMP has evaluated the implementation of the vitrification technology by testing a variety of silo surrogate waste stream formulations as part of the Vitrification Pilot Plant (VITPP) Program. It was observed that although a "blend" of the Silo 1, 2, and 3 waste streams reduced the overall sulfate concentrations of the feedstream, higher melter operating temperatures and the use of reductants were still necessary to control sulfate layering and foaming events within the melt pool. The required higher operating temperatures coupled with the addition of reductants creates a melt pool environment conducive to the formation of molten lead. The relatively high and varying lead content in the Silos 1 and 2 waste, without proper controls, can precipitate in the melter and compromise the integrity of the melter's materials of construction. These process conditions create a high degree of uncertainty in the ability to reliably produce a vitrified waste on a full-scale continuous basis. These phenomena were observed by the DOE-FEMP during the VITPP test runs and were significant causal factors in the December 26, 1996 melter incident. In addition, tests conducted on a "Silo 3 only" surrogate waste stream at the Catholic University of America - Vitreous State Laboratory in support of the VITPP program observed the same sulfate related issues.

Dilution of the Silo 3 waste to reduce the sulfate content to manageable levels for vitrification would result in a very large increase in the volume of residues requiring treatment, as well as, an associated increase in disposal volume that would be greater than the disposal volume for stabilized waste. In addition operation and maintenance costs, packaging, transportation, and disposal costs would also increase. Although dilution of the Silo 3 waste may be the most reliable method to manage sulfate levels, it is not the most practicable nor the most cost-effective.

While process flow sheets and melters could be developed to successfully vitrify the Silo wastes, the time and cost of developing such a process would be prohibitive. Therefore, it is recommended that the stabilization of the Silo 3 waste be performed separately from Silos 1 and 2 waste. Separating the wastes would significantly reduce the technical uncertainties and programmatic risks of vitrifying Silos 1 and 2 waste, because a lower-temperature, commercially available melter design could be used, thus reducing the uncertainties associated with melt pool chemistry, melter life, and materials of construction.

On the other hand, the FEMP has demonstrated, as part of the mixed waste stabilization program, that the stabilization technology (i.e., cementation) can be implemented as an effective treatment for the Silo 3 wastes through the successful treatment of similar, thorium bearing wastes. This same stabilization success has been shared by other DOE facilities. A table of stabilization experiences at DOE facilities is presented in Attachment 3. One of the main reasons for the success of the stabilization technology is its ability to treat material, which is homogeneous in nature, through a technically less complex process. Since stabilization has significantly fewer technical challenges compared with vitrification, the stabilization process would allow the treatment of the Silo 3 wastes by a more predictable process, which would allow for a more predictable schedule and cost.

The DOE-FEMP is confident that, based on the characteristics of the Silo 3 waste, sufficient knowledge and adequate stabilization technologies exist to produce an immobilized Silo 3 waste form that would satisfy all DOE-FEMP and environmental regulations and requirements for disposal at the NTS. Thus, it is recommended that the Silo 3 waste not be vitrified either individually or in combination, but be stabilized through another process, such as cementation.

Action: No further action required.

Commenting Organization: Fernald Citizens Task Force Commentor: FCTF
Section #: General Comment Page #: Line #:
Original Comment #: 4

Comment: Cementation does not result in as stable a waste form as vitrification and this has ramifications on both transportation and disposal. We would like a detailed analysis for all constituents and compounds in Silo 3 comparing the effectiveness of vitrification and cementation, the risks of transportation, and compliance with waste acceptance criteria. There is also the possibility that Silo 3 wastes could be treated off site. In order for this to be a viable option, an analysis of transportation of the untreated waste will be needed.

Response: Treatability studies performed during the OU4 Feasibility Study (FS) indicate cement stabilization is as effective as vitrification in immobilizing the constituents of concern in the Silo 3 wastes to meet transportation and disposal requirements. Attachment 4 provides a comparison of the effectiveness of cement stabilization and vitrification in immobilizing the constituents of concern in the Silo 3 wastes. Both treated waste forms would meet the NTS WAC, since both treated waste forms would remove the hazardous characteristic associated with the wastes.

FDF is performing a bench-scale treatability study focusing on stabilization of the Silo 3 wastes to provide additional support to the studies conducted during the OU4 FS and those vendors interested in bidding on the contract to remediate the Silo 3 wastes. The majority of the scope of the treatability study has been completed, and initial data confirms that cement stabilization is effective in treating the Silo 3 wastes to meet the NTS WAC. A draft of the final report is scheduled to be completed in April, with a final report scheduled for completion in May 1997.

Both treatment technologies produce waste forms that bind contaminants and prevent leaching, even after destruction of the waste form. The TCLP test simulates the affects of waste form destruction and potential contaminant leachability. The disposal of the waste in a sparsely populated,

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arid climate at a facility (such as the NTS), with proper institutional controls ensures that both treated waste forms would provide the same level of protection to the public. Appendix D of the Silo 3 Alternatives Report presents the incremental lifetime risk of the maximally exposed individual developing cancer due to normal transport of the treated Silo 3 wastes based on shipments of both vitrified and stabilized Silo 3 wastes. The incremental lifetime risk for the maximally exposed individual developing cancer is approximately 8×10^{-10} for vitrified Silo 3 wastes going to the NTS and approximately 3×10^{-10} for cement stabilized Silo 3 wastes going to the NTS.

Transportation risks associated with shipping untreated Silo 3 wastes have not yet been identified. If off-site treatment of the Silo 3 wastes is selected through the Request-for-Proposal process, these risks will be identified. The Silo 3 wastes would likely require preconditioning to reduce their dispersibility, in order to meet design and control requirements for DOE-site worker protection under 10 CFR Part 835 Subpart K. Appendix D provides the lifetime cancer risk to the maximally exposed individual due to shipment of conditioned Silo 3 wastes for off-site treatment and disposal. The incremental lifetime cancer risk under this scenario is 8×10^{-10}.

These risk values are well within the 1×10^{-6} to 1×10^{-4} NCP criteria range for acceptable risk to the public for remediation activities.

Action: FDF will make available to the public information obtained from the treatability study performed on Silo 3 wastes.

Commenting Organization: Fernald Citizens Task Force Commentor: FCTF
Section #: General Comment Page #: Line #:
Original Comment #: 5

Comment: There are political and legal, as well as technical, issues surrounding disposal of a different waste form than originally proposed. Prior to March 1, it is important to have written verification that the receiving facility is permitted to receive this waste, that the waste meets all legal requirements for transportation and disposal, and that local stakeholders at the receiving facility understand the changes being made.

Response: In a letter dated January 17, 1995, DOE-Nevada determined that the 11(e)(2) byproduct material contained in the K-65 (Silos 1 and 2) and cold metal oxide (Silo 3) silos met the intent of the small volume discussion in DOE Order 5820.2A, Chapter IV. This letter also stated that DOE-FEMP may pursue formal qualification of the treated silo wastes as an approved waste stream in accordance with the NTS waste acceptance criteria. This letter is presented in Attachment 5.

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The determination that the Silo 3 wastes are considered small volume is based on the discussion in DOE Order 5820.2A, Chapter IV and is not based on the waste form. Therefore, modification of the proposed treatment technology for Silo 3 wastes from vitrification to stabilization would not impact the determination. The approved ROD for the Environmental Impact Statement for the Nevada Test Site and Off-site Locations in the State of Nevada allows the continued disposal of low-level waste from current onsite and off-site generators, as long as the wastes comply with the NTS WAC. Neither the NTS ROD nor the NTS WAC specify a single treatment technology that must be used by generators for waste acceptance approval. Both documents allow the generator to select a treatment technology appropriate for the waste stream, with the requirement that the waste stream not exhibit a RCRA characteristic hazard. In addition, other wastes from the FEMP, such as thorium nitrate and uranium/thorium mixed waste, have been successfully stabilized and disposed at the NTS (See Comment #2). Both vitrified and stabilized waste forms would eliminate the hazardous characteristic associated with the Silo 3 wastes and both waste forms would meet the NTS WAC.

Treated Silo 3 wastes will be shipped in accordance with current United States Department of Transportation (DOT) requirements for shipping radioactive material. Treated Silo 3 wastes meet the criteria for low specific activity-II (LSA-II) material under DOT regulations. The proposed containers meet the criteria for industrial packaging - type 2 (IP-2) containers required for shipping LSA-II material. Any alternate containers proposed by the selected subcontractor must also meet the IP-2 container requirements.

Local stakeholders at the NTS are aware of the proposal to modify the selected remedy for the Silo 3 wastes. They are being updated at their monthly Community Advisory Board (CAB) meetings through attendance at the meetings by representatives from DOE-FEMP and FDF. In addition, they have had the opportunity to review and comment on the Silo 3 Alternatives Report. To date, the comments that have been submitted by the NTS CAB have expressed the similar concerns as the Fernald Citizens Task Force (FCTF) and the Fernald Residents for Environmental Safety and Health regarding the performance of the final stabilized waste form, transportation of the stabilizaed waste form, and the public's involvement in modifying the selected remedy for Silo 3 wastes from vitrification to stabilization with potential disposal at the NTS.

Action: DOE-FEMP will seek approval of the treated Silo 3 waste form in accordance with the procedures described in the NTS WAC.

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Commenting Organization: Fernald Citizens Task Force Commentor: FCTF
Section #: General Comment Page #: Line #:
Original Comment #: 6

Comment: The changes being made are significant enough to warrant outside review. We are in agreement with the appointment of an independent panel. It is important that this panel have a complete understanding of the concerns and issues of stakeholders as identified above and in the questions posed in the public comment period. It is also imperative that the independent panel complete its work prior to the March 1 deadline.

Response: An Independent Review Team (IRT) was assembled by DOE-FEMP and FDF with input from stakeholder groups. The primary function of the IRT was to serve as a technical resource to FEMP stakeholders relative to remediation of the Silos 1, 2, and 3 wastes. The IRT held their kick-off meeting Friday, November 15, 1996 and met several times throughout December 1996 , and January and February 1997. Based on information provided to the IRT, the expertise of the IRT members and IRT internal evaluations and discussions, the IRT issued a draft report, for internal review, with the majority of the IRT members recommending FDF vitrify Silos 1 and 2 wastes and stabilize the Silo 3 wastes with more studies needed for Silos 1 and 2 wastes. It is anticipated that the final report will be available by the end of March.

Action: DOE-FEMP and FDF will use all pertinent information associated with the Vitrification Pilot Plant, the Silo 3 Alternatives Report, the Vitrification Pilot Plant Upgrade Report, the IRT Report, and regulatory and stakeholders input to determine the preferred options for remediation of the Silos 1, 2 and 3 wastes in the Spring of 1997.

As key decision documents are issued for public review and comment, input from the FCTF and other stakeholders will be sought and addressed.

ATTACHMENT 1 - RESULTS FROM STABILIZATION/SOLIDIFICATION TREATMENT PROJECTS PERFORMED AT THE FEMP

	Thorium Nitrate Waste (Untreated)[a]	Thorium Nitrate Waste (Treated)[b]	Uranium/Thorium Mixed Waste (Untreated)[d]	Uranium/Thorium Mixed Waste (Treated)[d]	NTS WAC
RCRA Metals Present in Waste	TCLP (mg/L)	TCLP (mg/L)	TCLP (mg/L)	TCLP (mg/L)	
Arsenic	ND[c]	0.12	7,430	< 5.0	5 mg/L
Barium	9.56	3.5	250,000	< 100.0	100 mg/L
Cadmium	1.91	0.015	35	< 1.0	1 mg/L
Chromium	5.28	0.12	909	< 5.0	5 mg/L
Lead	0.59	0.05	7,946	< 5.0	5 mg/L
Mercury	0.005	0.00011	0.722	< 0.2	0.2 mg/L
Selenium	ND[c]	0.03	124	< 1.0	1 mg/L
Silver	0.03	0.017	138	< 5.0	5 mg/L
Radionuclides of Concern					
Total Thorium (mg/L)	408,000	< 5.0			NA[e]

[a] Results are the maximum concentrations of the samples taken.
[b] Results are the average concentrations of the samples taken.
[c] Not detected.
[d] Analytical data represents typical high concentrations from various mixed waste streams. Stabilization of the waste streams was able to treat the hazardous constituents to below regulatory levels for disposal at the NTS.
[e] Not applicable.

ATTACHMENT 2

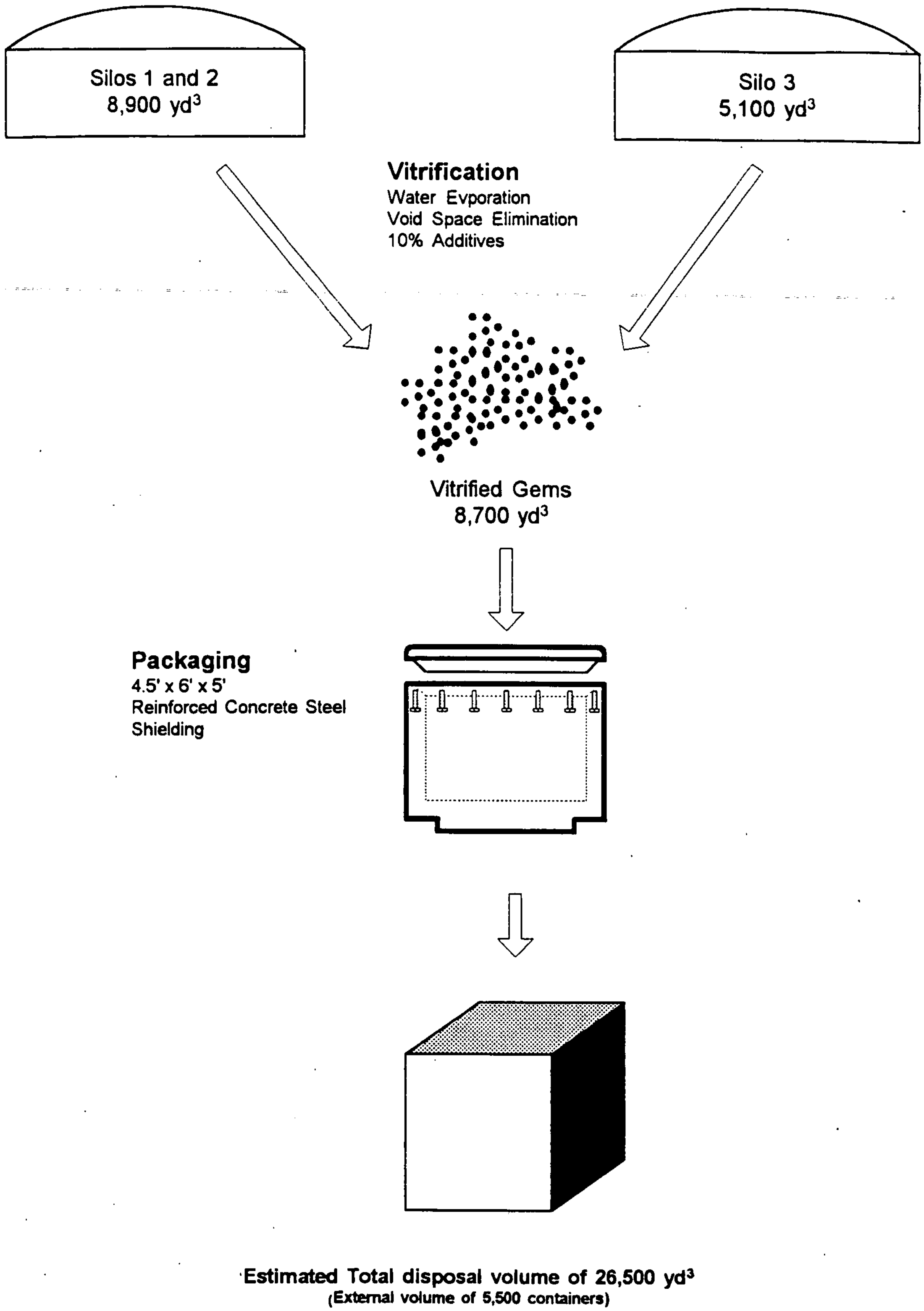

FIGURE 1
ESTIMATED DISPOSAL VOLUME FOR VITRIFIED SILOS 1, 2, AND 3 BLEND

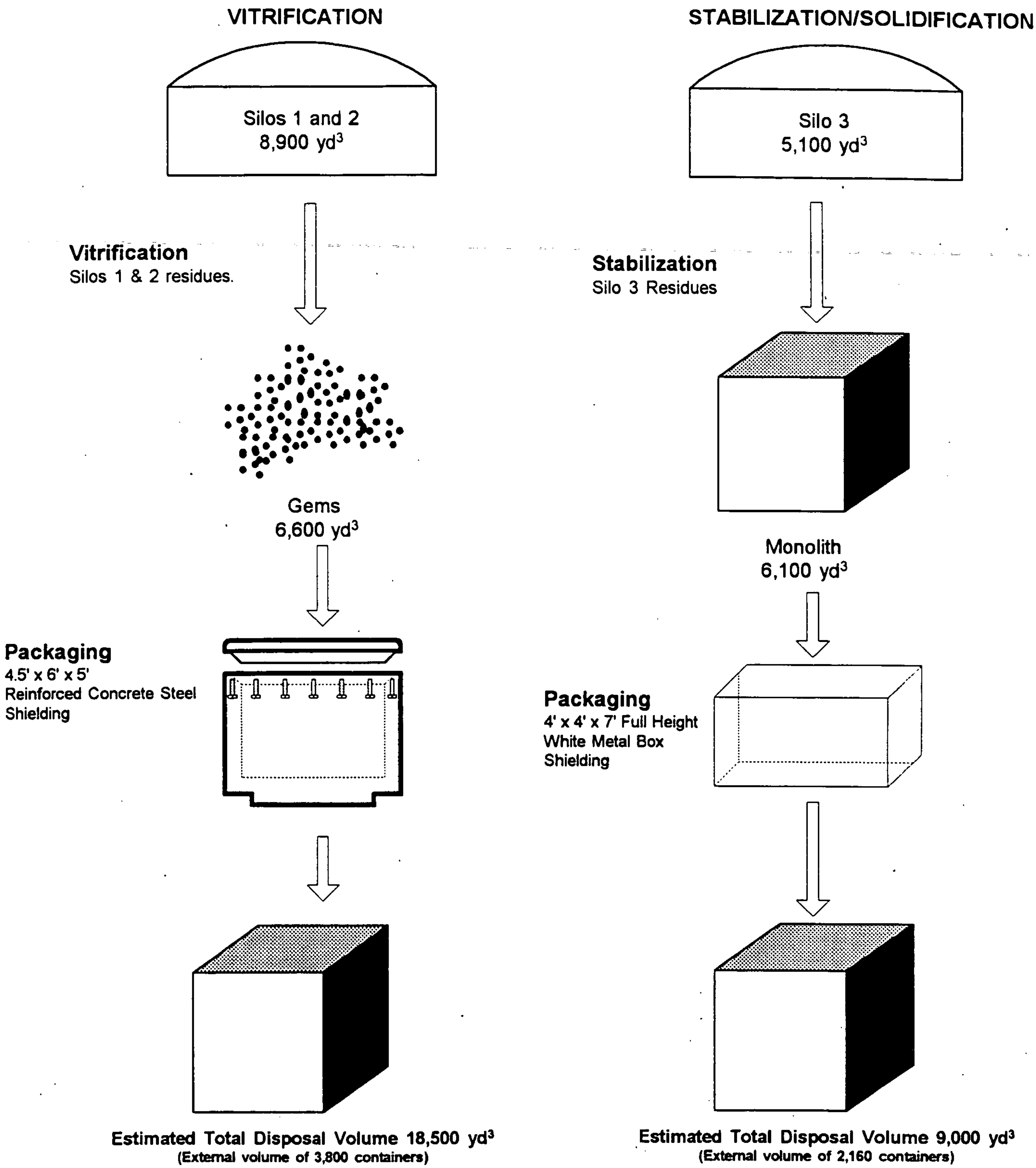

FIGURE 2
ESTIMATED DISPOSAL VOLUME FOR VITRIFIED SILOS 1 AND 2 RESIDUES AND STABILIZED SILO 3 RESIDUES

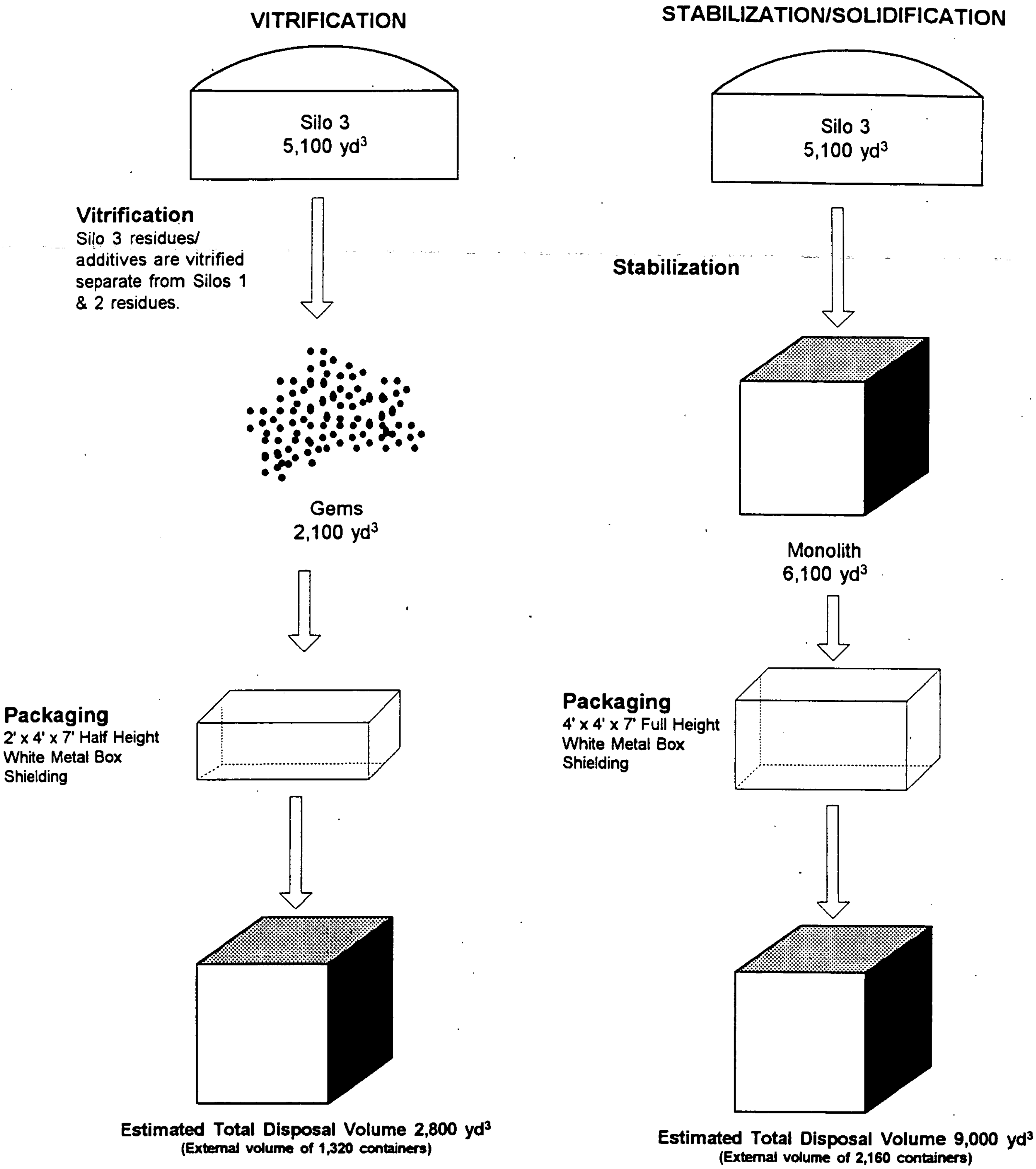

FIGURE 3
DISPOSAL VOLUME COMPARISON
TREATED SILO 3 RESIDUES ONLY
(Vitrification v. Stabilization)

ATTACHMENT 3 - DOE EXPERIENCES WITH STABILIZATION/SOLIDIFICATION

SITE	WASTE STREAM	TREATMENT METHOD	COMMENTS & ISSUES
Fernald - Plant 6	2,500 drums of metals uranium/thorium mixed waste	Cement grout into drum and white metal boxes	Successful treatment due to: strict quality control of operation, good process control program; excellent quality assurance program, experienced subcontractor, disposal facility identified up front so waste was treated to known acceptance criteria, good treatability study data, clear work scope and specifications, good configuration management.
Fernald - Thorium Nitrate	7,150 gallons liquid thorium nitrate	Neutralized and solidified with cement grout into drum	Successful treatment due to: strict quality control of operation, good process control program; excellent quality assurance program, experienced subcontractor, disposal facility identified up front so waste was treated to known acceptance criteria, good treatability study data, clear work scope and specifications, good configuration management, proper chemistry development.
West Valley	18,000 drums of high level waste	Pretreatment separated high level waste from low level waste	Proper waste segregation/preprocessing produced 2 waste streams optimized for each treatment technology. 1,500 drums high level waste being successfully vitrified. 19,877 drums low-level waste successfully cement stabilized.
Rocky Flats Pondcrete	Water, sediment, low-level mixed waste	Cement grout 1:5 waste to cement ratio placed in cardboard box	Improper curing, excess water, unsuitable storage containers. Production rate increased and cement usage decreased indicating quality control problems. Utilized mixers which rely on aggregate to aid in mixing process which is too slow for grout production.
DOE-Oak Ridge K-25 Plant	Mixed waste pond sludge (nickel, pH > 12.5, uranium)	Cement grout placed into drum	Problems with 46,000 out of 78,000 drums. Drum corrosion and leakage, too high pH level, improperly solidified material, poor recipe formulas, mix design development failed to adequately address phase separation, no consideration for final disposal waste acceptance criteria

ATTACHMENT 4 - COMPARISON OF VITRIFICATION AND CEMENT STABILIZATION TREATMENT ON SILO 3 RESIDUES

	Untreated Silo 3 Wastes[a]	Vitrified Silo 3 Wastes	Stabilized Silo 3 Wastes[b]		NTS WAC
RCRA Metals Present	EP-Toxicity (mg/L)	TCLP (mg/L)	Formula 1 TCLP (mg/L)	Formula 2 TCLP (mg/L	
Arsenic	42	0.6	0.045	0.045	5 mg/L
Cadmium	6	0.009	0.0025	0.0025	1 mg/L
Chromium	12	<0.01	0.5	0.03	5 mg/L
Selenium	12	<0.002	0.17	0.12	1 mg/L
Radionuclides	Leachability (pCi/L)	Leachability (pCi/L)	Formula 1 Leachability (pCi/L)	Formula 2 Leachability (pCi/L)	
Th-230	10 (17)[c]	17[c]	<1.1	1.4	
U-238	86[d]	95[d]	2	<0.34	
U-235/236	5	4	0.1	<0.02	
U-233/234	92	92	2	<0.34	
Ra-226	2,455	45	1,710	760	
Pb-210	87	55	360	7	
Radon Flux Rate	70 pCi/m²-sec	0.03 pCi/m²-sec	17 pCi/m²-sec		20 pCi/m²-s

a Analytical data for untreated Silo 3 waste was obtained from Tables 4-21 and Table 4-22 from the OU4 Remedial Investigation Report.

b Stabilization data has been updated from that presented in the "Draft Final Evaluation of Silo 3 Residues Alternatives," Volume 1, December 1996. Analytical data for metals was expressed as "dilution adjusted" in the Silo 3 Report to reflect leaching in terms of the volume increase associated with the cement stabilization process. The actual measured leach rates, presented in this table, for the cement stabilized waste forms are about half of the dilution adjusted values. Activities for the uranium and thorium isotopes in the cement stabilized waste forms were estimated using the analytical data for total uranium and total thorium presented in the Silo 3 Report and the specific activities for the respective isotopes, with the assumption that isotopes in the leachate of the cement stabilized waste forms had the same distribution as the isotopes in the leachate of the untreated Silo 3 wastes.

c The vitrification treatability study conducted by Batelle Laboratories detected 17 pCi/L of thorium-230 in the untreated Silo 3 waste leachate. Therefore, there is no increase in thorium-230 leaching in the vitrified Silo 3 waste.

d The analytical data for U-238 for untreated and vitrified Silo 3 waste are within the analytical laboratory's range for limit of error.

ATTACHMENT 5

Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

JAN 17 1995

Jack R. Craig, Acting Director, DOE Fernald Area Office, Cincinnati, OH

RESOLUTION TO THE REQUEST FOR APPROVAL TO DISPOSE OF 11(e)2 BYPRODUCT MATERIAL AT THE NEVADA TEST SITE

References: (1) Memorandum, Lytle to Fiore, dtd 11/16/94 (enclosed)
(2) Memorandum, Fiore to Lytle, dtd 2/15/94 (enclosed)
(3) Memorandum, Hamric to Aquilina, dtd 2/11/94

The J. P. Hamric to N. C. Aquilina memorandum, referenced above, requested our office to evaluate whether the 11(e)2 byproduct material contained in the K-65 and cold metal oxide silos could be disposed at the Nevada Test Site pursuant to DOE Order 5820.2A, Chapter IV.

We have completed a review in conjunction with DOE Headquarters and have determined that this 11(e)2 byproduct material meets the intent of the small volume discussion in DOE Order 5820.2A, Chapter IV. See referenced memorandums (1) and (2) above.

This conclusion allows your facility to pursue qualification of the vitrified silo residues as an approved waste stream in the regular manner under the current version Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, NVO-325. It should be noted that we are also evaluating a number of operational considerations regarding this particular waste stream (i.e., disposal configuration). Additional information may be necessary to complete our operational evaluation. We will request any information through our normal NVO-325 points of contact unless otherwise advised by your office. If our evaluation identifies any concerns that would appear to impact and/or complicate our ability to dispose of this waste stream, we will notify your office as soon as possible.

If you have any questions, please contact Wendy A. Griffin, Waste Management Division, at (702) 295-6751.

Joseph N. Fiore

Joseph N. Fiore, Assistant Manager
for Environmental Restoration and
Waste Management

WMD:WAG